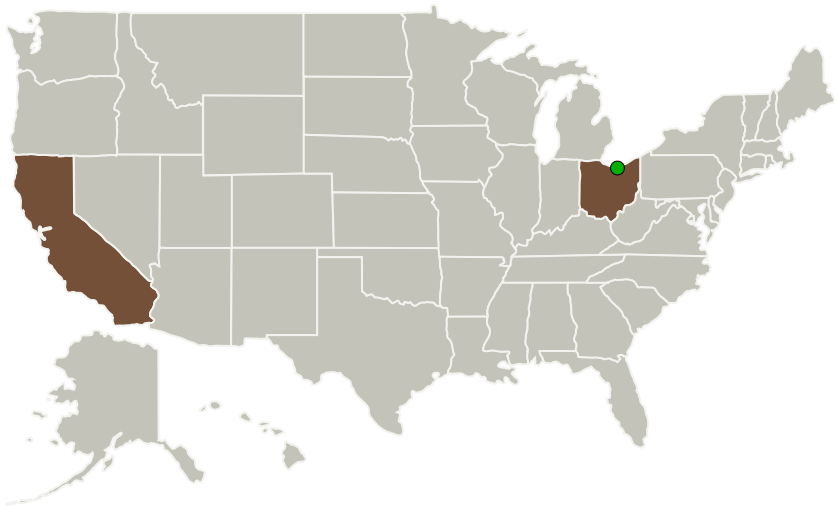
Active Combustion Control Valve, Phase I

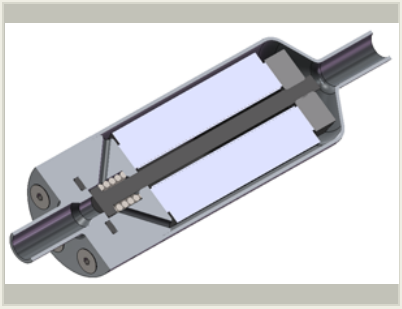
Completed Technology Project (2013 - 2013)

Project Introduction

Over the past decade, research into active combustion control has yielded impressive results in suppressing thermoacoustic instabilities and widening the operational range of gas-turbine combustors. Active Combustion Instability Control (ACIC) controls the combustion process such that the heat release profile is modulated to dampen the naturally occurring thermoacoustic instabilities. A major challenge to effective implementation of active combustion control is the availability of valves and actuators that provide adequate flow modulation control authority. The majority of the published work revolves around valves designed to modulate the main combustor flow. At present these valves are not designed to operate in a harsh environment and as such are required to be located outside the main flow path, reducing their control authority. To effectively meet the challenge, valves and sensors that are smaller, more responsive and robust must be developed. Ultimately the control valves are co-located with the fuel injection manifold. The trade-off for the harsh environment operation is the ability to maximize the flow modulation control authority. The objective of this research is to integrate the required control authority into an operational environment. This research initiates the development of a light weight fast-acting fuel control valve for harsh environment operation. The valve will allow the precise time dependent fuel control required for lean-burn combustor operability. In this Phase I research a proof-of-concept valve is designed, fabricated and cold-flow tested using commercially-available driver circuitry to uncover potential performance benefits and demonstrate feasibility of the approach for further development.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
WASK Engineering, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Cameron Park, California
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
California	Ohio

Project Transitions

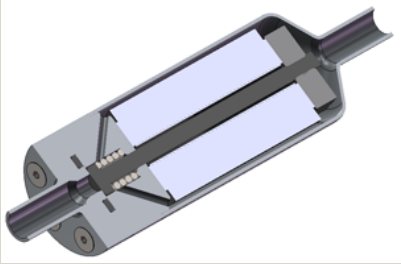
May 2013: Project Start

November 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140366)*

Images



Project Image
Active Combustion Control Valve
(https://techport.nasa.gov/image/133211)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

WASK Engineering, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Paul Phillipsen

Co-Investigator:

Paul Phillipsen

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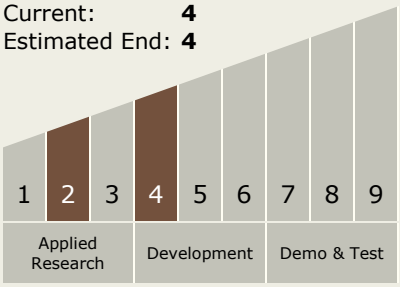
Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.3 Mechanical Systems
    - TX12.3.2 Electro-Mechanical, Mechanical, and Micromechanisms

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System